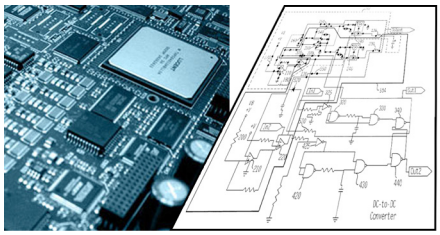
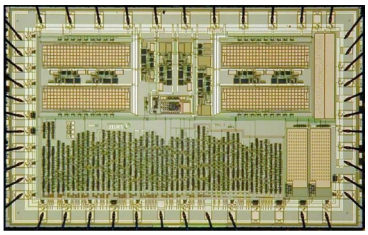
John F. Kennedy Space Center's Enhanced Isolated Current-to-Voltage Converter





The National Aeronautics and Space Administration (NASA) seeks partners interested in the commercial application of the Enhanced Isolated Current-to-Voltage Converter. The architecture of the Current-to-Voltage Converter is divided in three sections: input power section, input section, and output section. The input power section is processed using DC-to-DC converters to power the input and the output sections, independently achieving isolation from input power section to input section, input power section to output section, and input section to output section. The board takes a 4 mA to 20 mA input current loop and converts it to either a 0 V to 5 V output or a 1 V to 5 V output. The architecture exhibits excellent offset and drift characteristics while working within a wide temperature range (–25 ºC to +85 ºC) and providing surge protection for transients on the power input, input section, and output section. The device also has the capability to thermally compensate the electronics to achieve even better performance for extended temperature ranges or increased accuracy on the current-to-voltage conversion.

BENEFITS

- Capable of providing a very accurate current-to-voltage conversion throughout a wide temperature range
- Simplified system calibration with very high accuracy capability by means of a piecewise linearization software algorithm
- True electrical isolation between all interfaces of the system (power, input, and output stages)
- Optimized physical dimensions

technology ■ opportunity

APPLICATIONS

- Instrumentation systems
- Systems where current outputs need to be translated into input voltages
- Factory automation and instrumentation

TECHNOLOGY STATUS

- ☐ Patent pending
- ☐ U.S. patent
- ☐ Copyrighted
- ☐ Available to license
- ☑ Available for no-cost transfer
- ☐ Seeking industry partner for further codevelopment

Technology Details

The Current-to-Voltage Converter solves two problems: electrical isolation and temperature drift. The different sections of the architecture had to be electrically isolated, and the device had to work within stringent requirements throughout the temperature range (–25 ºC to +85 ºC). The electrical isolation was achieved by using two low-profile miniature surface-mount DC-to-DC converters. A unipolar DC-to-DC converter was used to power the input section, and a bipolar DC-to-DC converter was used to power the output section. A digital isolator was also used to isolate the microcontroller from the analog-to-digital converter. The temperature drift problem was overcome by a novel algorithm used to map the input to the output, therefore compensating for temperature and nonlinearities that result from surge suppression on the input and output of the device. The algorithm implements a piecewise linearization algorithm in as many sections as required so that the nonlinearities have no effect on the overall performance of the device.

Partnership Opportunities

NASA is offering the Enhanced Isolated Current-to-Voltage Converter to industry through a no-cost transfer. If your company is interested in this technology, or if you desire additional information, please reference Case Number KSC-12692 and contact:

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